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ENTOMOLOGY.¹

The Work of the Gypsy Moth Commission.²—For the last three years an experiment of great entomological interest has been in progress in the vicinity of Boston. About twenty-five years ago there lived in Medford, Mass., a man who experimented with silk worms of various kinds. Among other species which he had imported from Europe was that known as the Gypsy Moth—an insect that in Germany is very destructive to a great variety of trees and other plants. Some of these insects escaped and began developing in the neighborhood. They continued to multiply for many years until they became a plague to the community. The entomologist of the State Agricultural College was appealed to, and finally the Legislature appropriated \$50,000 to be expended under the direction of a Commission appointed by the Governor, “to prevent the spreading and secure the extermination of the *Ocneria dispar* or Gypsy Moth in this Commonwealth.” The Commissioners thus appointed remained in office about one year, when the work was turned over to a Committee of the State Board of Agriculture, consisting of Professor N. S. Shaler, Francis H. Appleton and Secretary Wm. R. Sessions. This committee soon called into consultation a number of prominent entomologists, and later appointed Professor C. H. Fernald entomological adviser. Mr. E. H. Forbush was elected director of field work.

Since the time of these appointments additional appropriations have been made and the work of extermination has been vigorously prosecuted. A large force of men has been kept at work fighting the insect in all its stages. The infested area has been accurately determined and every precaution has been taken to prevent its further spread. The results already obtained are very remarkable: where three years ago every green thing was alive with the worms, during a recent visit I had difficulty in finding any. The localities in which the insect is still present in numbers are comparatively few and are receiving so much attention from the director that a year hence they will be still fewer.

An idea of the general methods of work may be obtained from the following extract from the Director's first report: “It was at once seen that the work of crushing out the species would be an arduous task.

¹ Edited by Dr. C. M. Weed, New Hampshire College, Durham, N. H.

² Reports of the Mass. Board of Agriculture on the Extermination of *Ocneria dispar*, 1892 and 1893.



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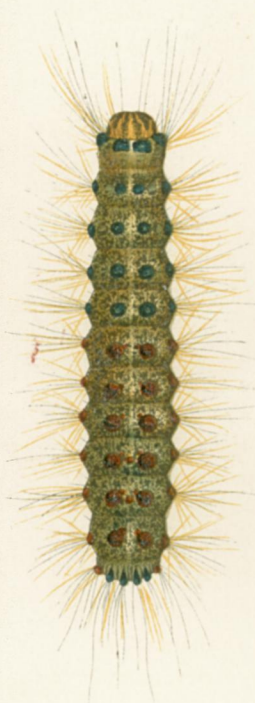
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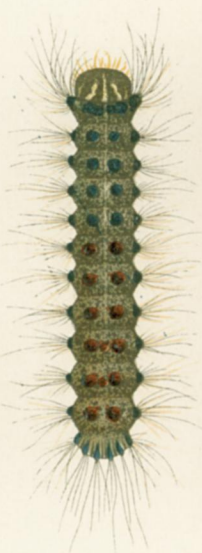
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For an undertaking of this character and magnitude, men were needed who by nature and training were fitted for the work. A perfect system was imperative. An intimate acquaintance with the country must be acquired. An accurate knowledge of the habits of the insects was a necessity, and constant vigilance an indispensable requisite.

“When field operations were commenced, the eggs of the gypsy moth were the only living form of the pest. The men were carefully trained to recognize and destroy them, and to distinguish between their eggs and those of our native moths. They were taught to observe all evidences of the existence of the gypsy moth, and were requested to secure all information possible in regard to its habits. Each inspector was instructed to make out a daily written report of the work done by himself and his men, and to include in this report his observations on the habits of the insect. Many valuable facts were thus recorded during the season. As the force was organized, each inspector was given a squad of men, and a section, indicated by a map, was allotted him, with instructions to inspect it, and destroy the eggs therein. When eggs were found upon a tree, the tree was marked with white paint and the locality designated upon the map. Special implements for the work were invented as necessity required, and a stock of equipments and materials was gradually accumulated.

“At this time the gypsy moth was supposed to be confined to eight or nine towns. Inspectors were sent out to determine how far it had extended, and soon found small colonies in other towns. It was at once evident that inspection must be continued until the limits of the infested district was determined. This method was followed until the new leaves covering the trees rendered further inspection impracticable. The work was resumed when the caterpillars had nearly reached maturity, was continued after the leaves fell, and is still in progress.

“After the men had received the training and experience without which their work would have been of little value, there remained but six weeks in which to make a hasty inspection of the territory and destroy the eggs. Although the work was thus necessarily hurried and imperfect, yet, in consequence of it, the insects have not since appeared in more than sixty localities where the eggs were found in the spring. The infested towns farthest from the centre were first visited by the men engaged in destroying eggs. The men worked from these towns toward Malden and Medford. Before this work was completed the eggs began to hatch. This rendered thorough work an impossibility. No attempt was made, therefore, in the spring, to complete this work in Malden and Medford, except upon trees on or near the highways.

"Wherever worthless, hollow trees were found infested, they were felled and burned. More than one hundred acres of brush and woodland have been burned over, and everything upon it destroyed. Stone walls in which eggs were laid were thoroughly cleaned by fire. In this way vast numbers of moths and their eggs were destroyed during the season.

"As it was observed early in the campaign that the distribution of the caterpillars was effected largely by their falling from the trees upon teams, an effort was made to destroy all eggs upon trees on or near the highways. Before the hatching of the eggs, many of the large street trees in Malden, most of those in Medford and some in Somerville, were banded with strips of tarred paper. This work was first undertaken in Medford. It was proposed by the selectmen of that town as a means of protecting the street trees from the gypsy moth and the canker worm. It proved a very effective means of preventing the depredations of each of these species. The town furnished the labor and paper for banding the trees in Medford. These strips were kept moist by a regular application of a mixture that the caterpillars could not cross. Great numbers of eggs had been deposited on buildings, fences and other objects near the trees. As soon as the young caterpillars left the eggs, instinct led them to the trees, and, as they crawled upward to find food, many were entangled in the cotton waste under the tarred paper and perished. Many more succeeded in getting upon the paper, and, in cases where they were very numerous, would undoubtedly have bridged the mixture upon the paper with their bodies, until some had passed over. The men employed in applying the mixture from day to day prevented this by killing them with their brushes. Some eggs in the trees which had been missed in the spring doubtless hatched, but most of the caterpillars descended from the tree at one time or another, and were unable to return. This greatly reduced the danger that had seemed imminent in the spring,—that the caterpillars would be distributed in large numbers."

Various other methods of destruction are now being used, and valuable experiments with insecticides are being carried on, chiefly at Amherst in the insectary of the Hatch Experiment Station under the direction of Professor Fernald.

It seems to me after a careful inspection of the work in progress that it is being well done, and that its continuation is a matter of national importance. Should this insect become generally distributed it would be liable to cause enormous losses, and even if European parasites were introduced there would inevitably be fluctuations in numbers which

would involve periodical outbreaks. I believe with Professor Fernald that the extermination of the pest is possible, "provided the work be continued for several years with sufficient appropriations to keep the entire territory under careful supervision."

Through the kindness of the Committee the NATURALIST is able to present the accompanying colored plate showing the various stages of the Gypsy Moth. The adult females are represented at Figs. 1 and 2; the adult males at 3 and 4; the pupa, (slightly magnified) at 5; the caterpillars at 6 and 7; the egg cluster at 8, and eggs magnified at 9 and 10.

Mr. Forbush has summarized the habits of this caterpillar as follows; "The gypsy moth feeds only when in the larva or caterpillar state. The length of larval life varies somewhat according to circumstances, but probably averages ten weeks. When the caterpillars are first hatched from the eggs they are light in color and covered with whitish hairs. In a few hours they assume a dark hue. They usually remain on or near the egg cluster until they change in color, and, should the weather be cold, they sometimes remain for several days in a semi-torpid condition upon the egg clusters. If the temperature is favorable they will search for food before they are twenty-four hours old. If a green leaf be dropped upon a table on which some of the caterpillars have been placed, they will all move towards it and climb upon it. During the first few weeks of their existence they remain most of the time on the leaves, feeding usually on the under side. Their feeding habits are so uncertain that no rule can be given which will apply to all individuals, but as a rule when about half grown they begin to manifest their gregarious instincts. At that time and for the rest of their existence as caterpillars they spend a large part of the day clustered in sheltered situations, and feed principally at night, going up the trees and out on the branches after dark, and returning before daybreak. Where they are so abundant that the food supply is insufficient, they evince much restlessness, and feed in numbers during all hours of the day and night. They may be seen hastening to and fro, both up and down the trees. Those which have fed sufficiently are at once replaced by hungry newcomers, and the destruction of the foliage goes on incessantly.

"At such times the trunks and lower branches of the trees are covered with a moving mass of caterpillars. Hurrying throngs are passing and repassing, and nearly every leaf or denuded stem bears up one or more of the feeding insects. The rustling caused by their movements and the continual dropping of excrements is plainly audible. On tall trees the larger caterpillars appear to crawl to the higher limbs, and they

seem to prefer to feed well out toward the end of the branches. They do not feed gregariously except when in great numbers; therefore they seldom strip one branch, as do the larvæ of the *Vanessa antiopa*, but scatter throughout the trees, eating a little from each leaf. Early in the season, when they are small and few in number, their ravages are scarcely noticed; but as they grow larger and more numerous their inroads on the tree decrease the foliage area night by night, until suddenly the leaves appear to have been eaten in a single night, and the tree is stripped."—CLARENCE M. WEED.